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FACTOR ANALYSTS AT LARGE: A CRITICAL REVIEW OF THE MOTIVATIONAL ORIENTATION LITERATURE *

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ABSTRACT

The methodology employed in fourteen motivational orientation studies was reviewed. All studies used either the Education Participation Scale, the Continuing Learning Orientation Index or the Reasons for Educational Participation Scale. Issues discussed concerned factor scoring, factor analysis, rotation, scaling, reliability, and the extent to which the three-factor Houle typology is an accurate representation of reality. There has been some well executed research in the orientation area. However, many deficiencies were identified and it was recommended that future orientation researchers emulate the strengths but avoid the weaknesses..

A fundamental principle of adult education concerns the need to match learner's needs and motives with educational environments. This principle is central to andragogy (32) - which stresses need-diagnosis - and the notion of congruence (5) which suggests that for every adult education participant there is an optimal environment and for every environment an optimal participant. Although educational environments should stimulate and acquaint learners with new needs, there should be a "goodness of fit" between participants and environments.

Despite widespread discussion concerning congruence and need-diagnosis few adult educators attempt to create learning environments or techniques compatible with clientele groups. This can be seen, for example, in New Zealand (9) where adult education is largely run in accord with the British tutorial-class model.

One reason why practitioners cannot create congruent learning environments is because they are not acquainted with instruments designed to measure motives for participation in adult education. The practitioner needs knowledge concerning participant motivation so that appropriate instructional techniques and learning environments can be designed. From a researcher's viewpoint an understanding of why people participate would facilitate the construction of theories and models with parsimony, predictive utility and implications for practice.

The task of this paper is to review fifteen years of "learning" or "motivational" orientation research relevant to this problem. During this time there have been attempts to study participant motivation in the United States (11, 42), New Zealand (6), Canada (8, 16) and Sweden (2).

Although many administrators have "measured" motivation with simple checklists this review is confined to research stemming from Houle's three-factor typology which suggests participants can be characterized as goal, learning or activity oriented. The review focusses on the measurement of participants' motives.

Measuring Motives

Researchers measuring motive for participation are often frustrated by an inability of adult learners to specify clearly their motive in a written or oral statement. Furthermore, sample size and research logistics usually require that data be gathered with an instrument wherein motives can be quantified. Most large-scale surveys 'measuring motive for participation did not employ measures based on the Houle typology or other theoretical formulations. Studies such as the Johnstone and Rivera (31) survey used short checklists embedded in longer interview schedules. But over the last decade there have been attempts to measure motives using instruments with known psychometric properties based on coherent theoretical formulations. The three instruments which provide the focus for this review are the first form of the Education Participation Scale (6), the Reasons for Educational Participation Scale (12) and the Continuing Learning Orientation Index (42).

The task of this paper is to examine fourteen studies which have used one of the three instruments. This review is needed because close examination of the motivational orientation literature shows it has passed through stages of development each characterized by positive features which should

be emulated and problems to be avoided.

The review deals primarily with problems traditionally associated with factor analysis but also shows how practitioners can be misled by "theories", models and typologies which are not adequately tested or are uncritically accepted as an "explanation" of behavior. The review is also made timely by Dickinson and Clark's (18) observations concerning an apparent inconsistency in results derived with similar motivational orientation measures. These writers were embarked on another task and did not explain the inconsistency. But if this inconsistency passes without explanation, and if a host of problems associated with orientation research are not understood, strengths will be obscured and errors accepted as fact. Although this review highlights deficiencies which are best remedied there has been substantial and well-executed research in the area. The critical comments which follow - particularly about the earlier orientation studies - should not be interpreted as general criticism or a failure to recognize that most studies closely approximate 'ideal' orientation research.

The Literature

The studies reviewed are listed in Table 1. Nine seem to have originated as doctoral research, three as Masters theses, and two as general research reports. The reviewer obtained an original or microfilm copy of each study because early in the review it was found that secondary reports - articles in Adult Education or conference papers - did not contain relevant detail. The reviewer corresponded with people who had

requested a copy of the E.P.S. or the R.E.P. to determine whether studies had been completed using these scales. Studies which employed the entire E.P.S., R.E.P. or C.L.O.I., or substantial parts of one instrument, qualified for inclusion in the review.

The research literature reviewed followed publication of The Inquiring Mind (28) in 1961. In the typical orientation study it is usual for researchers to develop an instrument to measure motive which consists of Likert-type items. The items are derived by examining Houle's book, transcripts of interviews with adult learners and reasons traditionally used to "explain" participation. Most researchers reduce their items to clusters which represent orientations purported to be similar to those described by Houle. Factor analysis is used to achieve the clustering process; factor scoring is used to ascertain the extent to which each participant is enrolled for the reasons which constitute each orientation. In most studies participant's factor scores are then related through correlation or analysis of variance to other socio-demographic variables.

Factor analysis is a complex mathematical process. But in the last fifteen years computer technology has improved to a point where even an unsophisticated researcher can generate factor scores. However, in considering the critical comments which follow, it should be remembered that the early factor analysts such as Sheffield (42) were pioneers, dealing with a technology and set of psychometric processes less sophisticated than those available today. For them a doctoral dissertation was as much a learning experience as it is today.

In an 'ideal' orientation study passing through the steps described above, these characteristics should be present:

1. The problem investigated should be anchored in a sound and parsimonious theory or model

2. The criteria for factoring and factor scoring should be fully described and justified to a point where replication by a 'naive' researcher is possible

3. There should be no carelessness or unwarranted addition or deletion of items from instruments

4. Instruments should be subject to test - retest reliability and validity procedures (the latter will be more difficult than the former)

Studies reviewed are listed in Table 1

INSERT TABLE 1

Problems in the orientation literature stem from a failure to observe the above points - from carelessness, a failure to provide sufficient information for replication, the provision of inadequate or no reliability information, a failure to understand criteria for rotation, a failure to recognize that output is a function of input and the assignment of almost magical unwarranted qualities to factor analysis. Some of the divergent results obtained with similar instruments stem from the use of different criteria for generating factor matrices and factor scores.

Because many graduate students in adult education come from disciplines without an empirical research background, they are understandably baffled by the complexities of statistical analysis. In the orientation literature, some writers enhance their work by openly admitting they do not understand the complexities of factor analysis; they usually acknowledge a debt to statistical experts. Others create confusion and unnecessary detective work by not including important details concerning factor structure, rotation and factor scores.

Salient issues relevant to the execution of a typical motivational

orientation study concern factor scoring, content of items in the measuring instrument, scaling, reliability of instruments, item content and criteria for factor analysis. A more general question concerns the extent to which the Houle (26) typology accurately describes the motivation of adult education participants.

Factor scores

After the inter-item correlation matrix has been factor analyzed and a suitable resolution into clusters achieved, the researcher will probably want to generate factor scores indicating the extent to which participants are enrolled for each of the orientations.

In the 'old' factor analysis literature factor scores were derived by summing responses to each item in a factor. This is a simple and direct way of factor scoring but does not have absolute regard to the contribution (loading) made to a factor by each item. Factor scoring which has regard to item contributions was a complex and time-consuming process beyond the capabilities of most researchers. High speed computing has changed that situation; factor scores can now be produced in accord with many criteria (22, 27, 35).

Many factor scoring procedures have merit. Table 1 shows that orientation researchers produced factor scores calculated from regression co-efficients or by summing over items. There are good arguments for both strategies. The scores calculated from regression co-efficients reflect the magnitude of the item contribution to the factor. Factor scores produced by summing over items are direct and keep the calculation processes close to the raw data. Because the number of items in each factor varies, it may be necessary to divide the 'factor' score by the number of items -

the procedure used by Morstain & Smart (36). Factor analysis and rotation involve abstract and complex analyses somewhat removed from the psychological characteristics of the people who completed the measuring instrument so any procedure which keeps the researcher close to raw data is worthwhile. If a researcher has good psychological or psychometric reasons for generating factor scores by summing over items, but wants each item to accurately reflect its contribution to the factor, weights may be assigned by squaring the correlation of the item with the factor. The sum of the squares should equal the communality.

Researchers should carefully examine print-out to see if 'true' factor loadings or correlations of items with factors are printed. If 'true' factor loadings are printed the squaring process is unnecessary.

There are good arguments for adopting most of the factor scoring criteria and authors of the studies reviewed generally included sufficient arguments and information to enable replication to occur. However, some studies would be difficult to replicate or review because the author inadvertently masked crucial information concerning factor scoring. Grabowski for example, says that "after the oblique rotation was completed, the (computer) program generated factor scores for each of the 170 subjects" (24,p.41). Although the computer program is identified, readers are unable to easily identify the criteria used for generating factor scores. Elsewhere in the dissertation (p.51) there are factor score means which suggest Grabowski was handling normalized factor scores. For example, Grabowski's means for male respondents on the seven factors were - .16, .00, -.08, -.02, -.04, -.12 and .04. Sheffield's factor scores also require detective work. In

the Solomon monograph (45) Sheffield presents an analysis relating orientation factor scores to "extent" of continuing learning scores but fails to specify how the factor scores were generated. Examination of the Sheffield (42) dissertation is also unhelpful. On page 47 there is discussion suggesting factor scores represent the co-ordinates of individual respondents in seven dimensional space but no detail concerning calculation. In view of Burgess' statement concerning Sheffield's factor scores (in particular, the "extent" of learning scores) being normally distributed this omission poses a problem. On the basis of present information it would be difficult to replicate or accept Sheffield's results. Stauffer merely noted that "following factor analysis, a computer program was written to establish an item mean score per factor for each person" (48, p.32).

Factor scores calculated from regression weights reflect the magnitude of the contribution made by each (high and low loading) item to the factor. Most computer centres maintain factor analysis programs which generate factor scores from regression weights. But users should note the potential for confusion created by factor scores which, through the calculation process, are normalized. Of the writers listed in Table 2, Boshier (8), Haag (25), Sovie (46) and Burgess (12) and probably Grabowski (23) generated factor scores adjusted so they fell on a normal curve. But, as shown below, Burgess may have thought his factor scores were normally distributed because of characteristics inherent in his data. Arguments concerning the "extent and degree" of his orientations were dubious because they stemmed from a misunderstanding concerning the normalization process.

Factor scores and factor structure

Factor scoring is important because it shows the extent to which participants are enrolled for reasons described in the items. Some writers, such as Ryan (41) have understandably confused factor structure with factor

scoring. The presence of items in a factor has been regarded as 'evidence' that people enrol for the reasons contained in an orientation. This is demonstrated in discussions concerning a 'religious goal factor'. Burgess considered enrolling for religious reasons to be relevant to the purposes of his study and so included 'religious' items. After examining his factors he found the religious items clustered together. He concluded that a "... new, separate and distinct cluster or group of reasons which moves some people to participate in educational activities" had been identified . Furthermore, "... the religious goal factor was not identified by any of the previous studies cited in the review of literature section". (11,p.22-23)

Factor analysis output is a function of input. If objects or items with similar content or meaning are placed in a correlation matrix they will likely emerge together. Burgess was aware of this and noted that previous studies had not revealed a religious factor, "... because items of this nature were not included in the instruments". But factor analysis simply reveals structure in a correlation matrix. Without factor scoring (or examination of item means) it is impossible to state that people enrol for any of the factors identified. Moreover, a factor can emerge simply because everyone in the sample indicated they were not enrolled for the reasons described. Items which elicit zero or very low responses will be inter-correlated and thus cluster together. To describe such items as a 'new' or previously unheard of factor would be erroneous. So, for Ryan (41) to say "... the significant outcome of ... (motivational orientation) ... research for adult religious education was the emergence of the 'Desire to reach a religious goal' as a significant factor in the reasons why adults participate in group educational activities" could reinforce confusion concerning the meaning of factor structure and factor scoring. An additional burden is that Ryan says he is quoting Sheffield when he is quoting

Grabowski 'discovered' another factor not found by other researchers. Using a short form of the R.E.P. he obtained a 'Desire to Study Alone' factor. He says: "All the previous studies reported did not find this as part of the ... orientation of the subjects they studied" (24. p.159) He noted that Burgess included this type of item in the R.E.P. (and did not obtain the factor) but might just as easily observed that other writers did not obtain the factor because they didn't include the relevant items!

The situation regarding 'new' factors is simple. If a researcher thought belly-aching was a significant orientation which caused people to participate in adult education he could include items such as "To obtain a stomach ache", "To foul my digestive system" and "To upset physical health". Obviously few or no people would say they enrolled for such absurd reasons. But even if no one or a few people checked these items they would cluster together because of similarity in item content. A cluster can occur because no one checked the reasons. Only factor scoring can indicate the extent to which an orientation is associated with participation. No doubt many participants are enrolled for religious reasons. But the extent to which people are enrolled for each of the orientations can only be established through factor scoring. Burgess carefully generated factor scores in his dissertation but these were not encompassed in the article discussed by Ryan.

In considering the value of factors, users should be cautioned against attributing 'reality' to a factor. Sheffield defined a learning orientation or factor "as the major principle which gives meaning or direction to the continuing learning act or process undertaken by the adult learner". (43, p.2) Stauffer used the Sheffield definition but substituted the word 'values' for the word 'principle'. In recent work Boshier has avoided the term

'learning orientation' (preferring 'motivational orientation') because there is no evidence to suggest the orientations studied are in any way related to learning either inside or outside an instructional environment. The construct under investigation has motivational origins. It is easy to name a factor and then believe there is some reality behind the name. But giving a factor a name, whether it be a 'Religious goal orientation' or 'Inner-directed professional advancement' does not give it reality. Factor names merely try to capture what seems to be the central theme of the factor. The reality of factors such as those measured by the E.P.S. or R.E.P. will only be known through research such as that conducted by Haag (25) who investigated the psychological under-pinnings of life-chance and life-space motivation.

Factors are tentative and subject to confirmation or refutation. As indicated, anything producing a correlation between variables "creates" a factor. Factors have been variously defined as dimensions, functional unities, parameters, taxonomic categories, classificatory systems and as artifacts (38). Royce (39) defined a factor as a "determinant of covariation, which means that we have made the assumption that factor analysis is capable of uncovering invariant factors ... which are demonstrably repeatable despite variations in initial factoring, populations sampled, measurements' and people. "In short, by a factor, we shall mean a true variable, a process or determinant which accounts for covariation in a specified domain of observation".

Motivational orientations are currently little more than descriptive concepts. Houle's (28) typology and Boshier's (8) description of the psychological concomitants and antecedents of life-space and life-chance motivation are two attempts to go beyond data in search of comprehensive explanatory concepts. These are valuable providing each attempt at explanation is tested in accord with the classical rational scientific model. Sheffield's definition of an orientation as a 'basic principle' does nothing which enhances understanding, prediction and control. It is redundant.

Normalized Factor Scores

Another intriguing finding concerning factor scores is the recurring near-normal distributions produced by researchers using University of Chicago factor analysis programs. For example, Burgess says "Sheffield, Ingham and Litchfield have shown in separate studies that the extent of participation scores from a given population range from 'low' to 'high' in an apparently normal distribution, just as do many other measured human traits " (12, p. 17). Discussing R.E.P. factor scores, Burgess says "the fact that the sets of factor scores were each near a normal distribution is a noteworthy finding" (12, p. 126). Later, he says "the normal distribution (factor) pattern indicates that among the 1,046 respondents each of the seven factors ... is found to exist to a similar extent and degree."

Important arguments have been built around normally distributed factor scores. But casual observation and familiarity with adult education students suggests that participants are not as motivated by religious concerns as by job-related or other reasons. The partition of variance among the Burgess factors also shows that people were not motivated to the "same extent and degree" by each orientation. Computer programs such as those used by Boshier (8), Haag (25), Sovie (46), and Zack (50) calculate factor scores from regression co-efficients. The resultant scores are normalized so the mean and S.D. remains the same for each factor. Boshier, Haag, and Zack produced normalized factor scores with a mean of zero; Flaherty's (20) factor scores were standardized with a mean of 50.00 and an S.D. of 10.00. Close reading of the Burgess dissertation reveals that the Missouri factor scores" ... by nature of the method of calculation, are in a standardized distribution.

A standardized distribution of scores shows the relative location of each score in the distribution by expressing the deviation from the mean in standard deviation units." (12, p. 121). The Burgess normally distributed factor scores did not mean the factors existed to a "similar extent and degree" in the population studied. On p. 123 of the Burgess dissertation there is a table showing the factors had a mean of zero and a standard deviation approaching one. The fact Burgess' orientations were normally distributed is not "noteworthy". Nor was it a function of data characteristics. It is merely a reflection of the method used to generate factor scores. If statements are required concerning the "extent" and "degree" of the orientations it would be better, in this circumstance, to sum over items.

Content of items

Confusion is created by differences in C.L.O.I., E.P.S. and R.E.P. items. For instance Bergsten, et. al. note that the "Burgess results are generally in agreement with those found by Houle, Sheffield and Boshier. Factors 6 and 7 are not, however, revealed in Houle's or Sheffield's studies. Interestingly enough, they are to be found in Boshier's (New Zealand) results" (2, p. 36). The similarities and differences identified by the Swedish writers occur because Sheffield, Burgess and Boshier adopted similar procedures for generating items. A carefully compiled item pool was created by Sheffield and Burgess through examination of Houle's typology, and an extensive list of reasons for participation secured from the literature, adult educators and adult students. Boshier secured items through an examination of The Inquiring Mind, the R.E.P.[1], high loading items of the Sheffield scale and through content analysis of data elicited in response to a question in an earlier New Zealand study concerning motives for attendance (7). A major strength of both the Sheffield and Burgess studies were the painstaking

procedures used to secure items. Because the three measures stem from Houle's typology and items have been exchanged there is similarity in results obtained.

Scaling

Item content can be moulded to suit the purposes of the study and the interests of the investigator. More significant than similarities in item content are differences in the psychometric characteristics of the scales provided with each item and the extent to which acquiescence response set and other confounding variables operate.

Items in the first form of the E.P.S. were keyed so that the 'high' side of the scale ('very much influence') was sometimes on the left side of the page and sometimes on the right. The Richmond study (8) showed that all the orthogonal factors, except one, contained an almost equal mix of 'left' and 'right' side items. There has been no systematic investigation of the extent to which the C.L.O.I., E.P.S. or R.E.P. is confounded by variables such as acquiesence but because both the C.L.O.I. and the R.E.P. list many items on each page, all scored in the same direction, there is a possibility scores are contaminated in much the same way as F-scale responses (37).

The first form of the E.P.S. elicited responses on a nine-point scale, the R.E.P. elicits responses on a seven-point scale and the C.L.O.I. on a five-point scale. Despite efforts to generate items which encompassed all (or nearly all) possible reasons for enrolling in an adult education activity, examination of item means from several motivational orientation studies reveals that most items yield means lower than the middle point of the response scale (4.5 in the E.P.S.).

The highest mean scores are usually found on the Cognitive Interest factor. A burden in this regard is that many researchers have not included item means and standard deviations in their reports. There is also the problem that numerical response scales (which require respondents to circle or otherwise indicate a number) introduce an unnecessary and possibly confounding variable. Unfortunately, the first form of the E.P.S., the R.E.P., and the C.L.O.I. are similar in this regard.

During the 1950's and 1960's psychometricians such as Couch & Kenniston (15), Block (4) and Peabody (37) alerted test users to the gross contaminating effects of response bias. Among the artifacts capable of destroying construct validity are 'yeasayers' and 'naysayers', items keyed and scored in the same direction, and the tendency of some respondents to adjust 'bottom-of-the-page' responses in the light of 'top-of-the-page' answers. There is also the problem of social desirability induced by item wording or the scaling format. In 1971 the possibility of "acquiescence, response and positional bias" in the C.L.O.I. was noted (6). Here is the C.L.O.I. scaling format (with one sample item)

	Very Frequently Important For Me	Frequently Important For Me	Sometimes Important For Me	Seldom Important For Me	Never Important For Me
To fill a deep, rich curiosity about life and ideas	5	4	3	2	1

The word "important" would be inclined to elicit more socially desirable responses than the E.P.S. or R.E.P. scaling formats. It is interesting to speculate on why Burgess changed the Sheffield scaling format when designing the R.E.P. Both Burgess and the present writer employed the word "influence" to focus the respondent on internal and individual motives rather than external, perhaps socially desirable or "important" determinants of participation. However, the Burgess measure contains a seven-point scale which may not be ordinal. Here are the R.E.P. scale categories (with one sample item)

	Never influences me	Very seldom influences me	Once in a while influences me	Occasionally influences me	Fairly often influences me	Very often influences me	Always influences me
To be better able to serve a church	1	2	3	4	5	6	7

The two extreme categories can be accepted ('Never influences', 'Always influences') but the three central categories probably have very confused psychometric qualities. For example, place your hand over the above sample and consider whether 'occasionally influences me' denotes a greater or lesser influence than 'once in a while influences me'. Subjectively, which order makes greatest sense? Would it be a scale ranging through "Once in a while influences me", "Fairly often influences me", "Occasionally influences me" or a scale in this order - "Occasionally influences me", "Once in a while influences me", "Fairly often influences me"?

Grabowski was not satisfied with the Burgess measure. As well as deleting twenty items which failed to load on any factor he changed the scaling to this:

	Did not influence me	Slightly influenced me	Moderately influenced me	Greatly influenced me	Very greatly influenced me
To meet new friends	1	2	3	4	5

The first form of the E.P.S. required participants to check these categories (with one sample item):

	Very much influence		Much influence		Moderate influence		Little influence		Very little influence
To seek knowledge for its own sake	9	*	7	*	5	*	3	*	1

The intention was for "Moderate ..." to be a central anchor balanced by "Much ..." "Little ..." on either side and "Very much ..." and "Very little..." on the extreme poles. One difficulty with this balanced scale is the absence of a "no influence" category which frustrates some respondents.

Researchers administering instruments to large samples will know there are often participants enrolled in more than one class. Their motives for participating in one class will not always be the same as their motives for another class. This highlights another difficulty associated with both the Sheffield and Burgess measures. Whereas the E.P.S. instructions ask participants to think back "to when you enrolled for your course this year" the R.E.P. requires participants to indicate "how often each of the 70 reasons ... influence you to participate in educational activities" while the C.L.O.I. directs participants not to focus on present participation but to respond after "thinking back over your educational activities of the past year."

An invitation to consider all "educational activities" will erode construct validity and reliability. Investigators do not know much

about the extent to which motives vary as a function of the learning environment. However, most research projects are better served by the measurement of precise and immediate motives pertaining to the most recent (or present) activity. Respondents will give more reliable and valid responses if they only have to consider their present activity.

Close examination of the studies listed in Table 1 shows that writers adapt instructions to suit the purposes of their study (e.g. Grabowski changed the instructions of the R.E.P. so respondents would only consider the motives which influenced them to enrol in a self-study Bachelors program). Researchers should change instructions to suit their purposes but be aware that changes could effect factor structure.

Note also that most users have had no regard to possible contaminating effects induced through employing different numbers of items per page. Burgess apparently used 12 to 14 R.E.P. items per page; Sheffield had 17 to 18 items per page; Bennett using Sheffield's instrument, had 3 to 6 items per page; Flaherty used an adaptation of the C.L.O.I. with 8 to 10 items per page. Boshier (8) and Zack employed the E.P.S. with three items per page. Haag (25) used the revised E.P.S. which has 11 items per page and scale poles which are systematically varied. Where the poles of response categories are systematically varied there can be many items per page. But when items are all cast and scored in the same direction, and respondents circle numbers, as in the R.E.P. and the C.L.O.I., users should be alert to possible error arising through large numbers of items per page ("I seem to have made a lot of answers down the right - perhaps I'd better put a few over on the left.")

Marple (34) used 16 items which followed Sheffield's classification with a four point scale which required respondents to indicate whether each reason was "Very important", "Moderately important", "Relatively important" or "Unimportant". Marple's scale is elegant but perpetuates the problem associated with using the word "important". Also, it is not a fixed-interval scale because of a lack of difference between "moderately" and "relatively".

Reliability

Scant regard is given the need to produce data showing the stability of instruments over time. In each measure items loading high on each of the factors are scattered randomly through the instrument. Split-half reliability and coefficient alpha (as used by Morstain & Smart) is therefore useful but less crucial than test re-test data.

The E.P.S. has test re-test item reliabilities which were all significant at the .001 level ranging from .44 to .98 with an average of .81 (6); the R.E.P. has item test re-test reliabilities which ranged from a low of .51 to a high of .84 with an average of .66 (12). The average item reliabilities for the R.E.P. are probably lower than E.P.S. item reliabilities because of differences in the scaling format discussed above. However, the R.E.P. has acceptable reliability levels which mitigates the fact Grabowski, who used an adaptation of the Burgess instrument, apparently did not produce test/re-test reliability data. Sheffield did not produce C.L.O.I. test re-test reliability data. Haag (25) produced test re-test reliability coefficients for the revised E.P.S.

Number of items

Researchers could consider the extent to which they can afford to have respondents completing passenger items which do not load signifi-

cantly on any factor, lower face validity and lengthen the time taken to complete the instrument.

Researchers and adult education administrators will usually employ one of these measures with questionnaires gathering social and demographic data. In classroom settings and during a mailed survey it is desirable to use as little time as possible. The E.P.S. is the shortest of the three instruments available and, according to a recently completed nine-factor solution contains only one item which loads on two factors and no passenger items. The data from this analysis which involved 691 adult education participants enrolled with the Surrey School Board, appear in Table 2.

INSERT TABLE 2

Sheffield did not include in his factors items which met the criteria for inclusion (loading .41 or greater). For example, item 40 loaded - .41 on Factor III but was not included in that or any other factor; items 6, 18, 42, 44, and 49 all had loadings equal to or greater than .41 on two factors but were only included in one factor. For example, item 18, "To gain recognition among peers" loaded - .45 on the Personal-Goal orientation and .42 on the Need-Fulfillment orientation yet Sheffield only included it in Factor III. There is also the curious fact that Sheffield seems to have disregarded the sign of the factor loadings, which casts doubt on the direction of the correlations between the orientations and the "extent of continuing learning" scores. In Sheffield's matrix Factors II and V have positive signs in front of the factor loadings but when listed on p. 16-17 of the Solomon (45) monograph all factors have negative signs. It is thus difficult to interpret the correlations on p. 19 which are all positive. The direction of the relationships identified is crucial to the study.

Clark (16) used the C.L.O.I. in the study described in part by Dickinson & Clark (18). There were six 'passenger' items that failed to load more than .40 on any factor - items 6, 13, 24, 27, 33 and 47. Clark also encountered items which loaded significantly on more than one factor but included them in accord with the previously established criteria. These factorially 'impure' items were C.L.O.I. items 7, 31, 44, and 49 which loaded significantly on two factors and item 42 ('To feel a social need to be part of an accepted group') which loaded significantly on three factors. Flaherty (20) shortened the C.L.O.I. to 25 items. Sovie (46) also produced impure items. C.L.O.I. item 6 loaded significantly on three factors (I, IV and VII), while items 8, 9, 13, 19, 22, 23, 35, 38, 42, 48 and 52 all loaded significantly on two factors. Factors I and II seemed to be the most unstable; of the twelve impure items, five involved Factor I and four involved Factor II. However Sovie included every item which met the criteria for inclusion in her factors.

Stauffer (48) added eight items to the C.L.O.I. Essential information was not included in this dissertation but it appears that ten items proved to be inadequate in terms of clustering into orientations. Items with high loadings which for some reason were not included in the orientations were, on Factor I - Item 18 (.43), Item 33 (.52); Factor II - Item 14 (-.46), Factor VI - Item 33 (-.41). Item 31 loaded -.52 on Factor II and -.71 on Factor IV but was only included in Factor IV; Item 39 loaded -.44 on Factor VI and .66 on Factor I but was only included in the latter.

In Boshier's (6) New Zealand study the E.P.S., after oblique rotation, contained three passenger items (numbers 17, 21 and 30) which did not load significantly on any factor. Had the criteria for inclusion in a

factor been dropped to .34 all three passenger items would have been incorporated into the factor structure. Only item 46 had significant loadings on two factors. In the Richmond study (8), which involved rotation to a different criterion, there were eight passenger items which would have been included had the criterion been lowered to .36 (with the exception of item 30 'To obtain some immediate practical benefit' which has been dropped from the revised E.P.S.) or a six or seven factor solution adopted. Morstain & Smart (36) used the E.P.S. with four passenger items (numbers 7, 41, 46 and 48). Three of these four items have been deleted from the revised E.P.S. The E.P.S. contains mostly pure items because impure items were largely eliminated during successive factor analysis conducted when the scale was in development.

Burgess (12) was dissatisfied with the number of passenger items in the R.E.P. and, in concluding his dissertation, recommended that some modification occur. Burgess carried fifteen passenger items during his study; on a preliminary factor analysis Grabowski (24) found twenty passenger items in the R.E.P. which he eliminated, thus shortening the measure to 50 items.

Rotation

Factor analysis usually begins with a matrix of item inter-correlations. Rotation resolves the matrix into clusters of items. The criterion for rotation will usually be related to the purposes of the study. For example, if a researcher wants correlated factors, oblique rotation might be used whereas orthogonal rotation will usually maximize a lack of correlation between factors. Thus in Boshier's (6) investigation of the three-factor Houle typology, oblique rotation was used because

higher-order factors should have factored into three clusters resembling the goal, learning and activity orientations. Inter-correlations between first-order factors produced with oblique rotation provided the basis for the higher-order analyses. But when a hypothesis, model or problem demands reasonably uncorrelated and independent factors, orthogonal rotation is usually appropriate. Sometimes it is appropriate to produce both orthogonal and oblique factors if the usefulness of a measure is enhanced by the availability of scoring procedures keyed to the results of both types of rotation such as for the Conservatism scale (49).

Whatever the rotation criteria employed, there is an obligation on researchers to inform readers of the reasoning behind their choice. Some writers admit they obtained advice from others concerning appropriate factor analytic models and do not themselves fully understand the complex processes involved. Other writers included such sparse information that replication is virtually impossible. The secondary report of Sheffield's (43) study contains inadequate detail concerning the criteria for factoring and factor scoring. On p. 46 of his dissertation Sheffield explains that standard scores were calculated from C.L.O.I. data and on p. 47 discusses rotation and factor scoring. This discussion does not clearly indicate why standard scores, rather than raw data were factored. The criterion for rotation appears to be orthogonal but the discussion concerning factor scores concerns geometric characteristics "in the seven dimensional space" and is so vague that replication would be difficult.

Harman (26) says the heated and spirited controversies about the "best" method of factor analysis are over. Recent exchanges such as the Banff symposium (40) show there is now a fuller understanding of

the advantages and disadvantages associated with each method than when Spearman, Thurstone, Burt and Holzinger labored over hand calculation and manual rotation. Nevertheless, it was reasonable to wonder why Burgess specifically rejected the "Joreskog computer program" because "it was programmed to rotate the solution orthogonally" (12, p. 89). The oblique solution adopted by Burgess was suited to the problem investigated but, in view of questions raised concerning the utility of the three-factor typology, it would be useful to know the inter-correlation between the factors so any resemblance to the Houle formulation would be public. For the same reason it would be useful to know the inter-correlation between Grabowski's factors.

Curiosity concerning this and other questions led to an enquiry which revealed that Burgess did calculate, but did not publish, the inter-correlations between his factors. These are presented in Table 3.

INSERT TABLE 3

In view of the large sample employed in the Burgess study it is obvious that all the inter-correlations except one (between the "Social-Goal" and "Religious" factors) are statistically significant. There are some very high and statistically significant correlations in this matrix. For example, with 1,046 respondents the correlations (such as r -.91 between Desire to Escape and Desire to comply with formal requirements) show the seven factors were strongly related. Factor analysis of this matrix, which is beyond the scope of this paper, could possibly result in a structure similar to the Houle typology. It would appear that the Personal Goal, Escape and Formal Requirements factors have so much variance in common with other factors that

meaning could be enhanced by a coarser structure than the one presented by the first-order factors.

Burgess' study did not concern the correctness or incorrectness of the Houle typology; his primary task was to relate factor scores to other variables. In answer to our enquiry Burgess (13) also revealed that he rejected the Joreskog orthogonal rotation program "since it seemed reasonable ... that there could well be correlation among the various hypothesized factors ... I wanted to allow for the correlation to exist among the various factors." The correlation matrix presented above shows this reasoning was correct!

Number of factors

The number of factors extracted from a correlation matrix is determined by the number of items in each factor, the meaningfulness of the clusters, the variance accounted for, and, above all, the nature of the problem. In some circumstances very finite and specific factors are appropriate; in other studies coarse factors will serve the purpose.

Although relationships in the world are rarely orthogonal, and subjectively it would appear that motivational orientations are correlated, it is likely that researchers will continue generating uncorrelated factors because of the need to relate 'independent' scores to other variables. But the different purposes served by orthogonality and obliqueness explain Dickinson & Clark's observation concerning the fact Morstain & Smart's six factors "were more comparable with Sheffield's and Sovie's ... than with Boshier's (New Zealand) third-order factors" (18, p.8). The explanation is simple; Boshier's New Zealand study employed an oblique rotation while the other studies contained orthogonal factors. Boshier's (8) subsequent study generated orientations remarkably similar to the Morstain & Smart factors. Both Morstain &

Smart (36) and Boshier (8) used the E.P.S. and rotated orthogonally. Any attempt to compare the factor structure of the E.P.S., R.E.P. or similar instruments should have regard to the factor analytic model employed.

Is the Houle typology correct?

It is now fifteen years since Houle's three factor typology became available. The typology was based on interviews with 22 continuing learners. Sheffield had access to the transcripts of these interviews. Dow (19) attempted a replication of the Houle study with 24 adult education participants in San Francisco. She was unable to obtain Houle's interview schedule and recorded data using a portable typewriter. Dow did not attempt an empirical analysis but subjectively assessed motives described by respondents; she concluded the situation was more complex than Houle envisaged, particularly with regard to the activity orientation.

Despite the small size of Houle's sample and the absence of empirical analysis, it has become a useful and durable point from which to begin research into motivational orientations. But although many matrices have been generated, no writer has clearly accepted or refuted the typology.

Most researchers produce seven or eight factors and then argue their findings "confirm", "sharpen" or "support" the Houle typology. For example, Sovie says her "learning orientations were of three major types - learning, goal and activity"oriented (46, p. 145) but elsewhere says "eight patterns of learning orientations were identified" (p. 154). Flaherty extracted 12 factors which were subject to a higher-order analysis to produce second-order factors. Flaherty says "the six

first-order learning orientation factors were subsumed under three second-order factors which were somewhat similar to those proposed by Houle" (20, p. 58). However, Flaherty used only 25 items from the C.L.O.I. and admitted that "the role of some of the orientation factors, which had negative correlations with the criteria, is not understood " (20, p. 116).

Burgess examined various matrices and eventually accepted seven interpretable orientations from a fifteen factor solution. However, he reported that "the slight difference between the hypothesized and the emerged factors does not alter the basic framework originated and reported by Houle ... and further clarified by Sheffield " (11, p. 27). Recently, Burgess said that " ... Houle's original work is not wrong. It just did not go far enough to include all the basic orientations which exist" (13, p. 5), Boshier (6) concluded that at a second-order level, oblique E.P.S. factors "do not closely resemble the Houle three-factor typology" but at a third-order level there was " ... a structure not unlike the ... Houle typology." However, Boshier's New Zealand analysis resulted in four, not three, essentially uncorrelated oblique factors.

Although orthogonal factors are not well-suited to testing the Houle typology it is relevant to note that the number of meaningful factors obtained is always greater than three. Dickinson & Clark extracted eight (seven meaningful) factors; Sheffield produced five factors; Sovie produced eleven (eight meaningful) factors; Boshier (8) rotated five factors after perusing solutions consisting of up to thirteen factors; Zack rotated the same five factors; Haag (25) adopted a six factor solution; Morstain & Smart (36) retained six orientations

from an eleven factor solution; Grabowski (24) listed seven interpretable orientations from a twelve factor solution.

Many authors maintain their factor matrices "sharpen", "extend" or "clarify" Houle's typology but only Boshier (6), Burgess (12), Flaherty (20) and Grabowski (24) employed an oblique rotation allowing factors to inter-correlate. However, the extent to which Houle's formulation accurately represents participant-types still cannot be established; Grabowski (24, p. 197) had five factor inter-correlations which were significant; Flaherty's second-order learning orientation factors were created from a matrix which included vocabulary and reading test scores along with critical thinking and Otis I.Q. scores; Boshier's (6) third-order factors were somewhat ambiguous.

A determined research effort using oblique rotation or cluster analysis will eventually resolve Houle's formulation. In the meantime Sovie's (46) attempt to assemble the different factor solutions under Houle's three categories, a strategy repeated by Dickinson & Clark (18) and others, should be regarded as subjective and tentative. Such attempts to classify seven or eight finite uncorrelated factors as goal, learning or activity orientations violates their orthogonality. It is this subjective sorting process which leads writers to conclude that their results "confirm", "sharpen" or "extend" the Houle typology. Subjectively, these classifications make sense but they are without empirical foundation. For example, on p. 115 of her dissertation Sovie shows her orientations are close to orthogonality (uncorrelated). Yet later in her dissertation (p. 124) she has a table "clustering" the factors, as if they were correlated, under the three labels suggested by Houle. There is a need to deal with this problem because while

researchers manifest confusion there are practitioners like Garrett (21) who divide participants into the three types as if they were real.

There is certainly a reluctance to simply say the three-factor typology is wrong. Houle (29) acknowledges that the situation is more complex than was envisaged in 1961 and could be persuaded to up-date the typology having regard to the studies generating more than three factors. He indicates a willingness to return to the orientation area to test a framework more comprehensive than the three factor typology. Houle's return to the area will be welcomed by psychometricians who are now equipped with tools more sophisticated than those available in the 1960's.

Famous typologies, such as Sheldon's (44) physical types, endured past the point when empirical validation failed. Houle's typology is elegant and makes subjective sense but until motivational orientation researchers develop a suitable psychometric procedure to test its validity it cannot be accepted or rejected as an accurate description of adult learners. It remains as an interesting problem for research which has relevance to the design of instruction and the creation of learning environments congruent with the learner's motivational state(s). The Houle typology appears to be outmoded but pessimism is not fully justified until it has been subjected to investigation using methods superior to those employed so far. One current thrust is the attempt to depict participants as life-space and life-chance oriented (8). Life-space participants are assumed to be participating in adult education to satisfy needs similar to those in the upper levels of Maslow's hierarchy while life-chance participants are more 'coping-oriented' and enrolled to satisfy needs such as those in the lower levels of the need hierarchy.

Data has recently become available which shows this model has considerable explanatory power and predictive utility. There are significant correlations between measures of neuroticism, self actualisation and life-chance ... life-space motivation.

CONCLUSIONS

An ideal orientation study employs a valid and reliable instrument with known psychometric properties. The problem investigated should flow from some clearly articulated theory or model. The resultant research report should contain all relevant descriptions of criteria for factor scoring, factor analysis, rotation and scaling. The report should demonstrate that the methodology and analysis was appropriate for the problem investigated. If the researcher does not fully understand the complexities of multi-variate analysis readers should be informed.

The articles reviewed here represent developmental stages in orientation research. Although adult education researchers are not exempt from the need to observe general social research procedures there were some substantial pieces of work produced at a time when the technology of factor analysis was less sophisticated than it is today. Several writers who provided important findings for subsequent orientation researchers describe how they adapted data and analysis to suit the analytical tools available at the time.

The attitude adopted for this review stems from the fact science is a cumulative process; each new study should improve on what went before. Because the earlier studies were conducted at a time when researchers were less aware than at present of artifacts and variables which confound measurement, this does not in any way diminish their importance. They were an essential part of the cumulative research

process and, particularly in the case of the Burgess and Sheffield studies, contain many sound procedures which should be emulated by other orientation researchers.

This review has focussed on issues concerning factor analysis and orientation research where ambiguity and complexity have traditionally nurtured vigorous methodological debates (22, 27, 35, 40). But dwelling on pitfalls does not undermine the basic methodological precision of the major orientation studies. Despite arguments concerning factor scoring, rotation and the other issues canvassed herein, the major studies closely resemble the 'ideal' described above. For example, Sheffield's attempt to operationalize the Houle typology was well-founded and launched a strategy followed by other researchers; the Burgess dissertation contains correlations between factor scores and socio demographic variables which go considerably beyond the area traversed in the secondary report of dissertation data (11); Sovies' study was well executed and closely approximates the 'ideal' orientation study as do other studies reviewed.

This review has focussed on measurement of participants motives. The orientations are reasonably stable across time and space so now could be the time to shift emphasis toward an exploration of the psychological concomitants and antecedents of motivation.

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TABLE 1

MOTIVATIONAL ORIENTATION STUDIES USING
FACTOR ANALYSIS OF MOTIVATION INSTRUMENT

Authors (in alphabetical order)	Test Re-test reliability	Factor analysis model	Type of rotation	Higher order analysis	Rationale factor scoring specified	Type of factor scoring
BENNETT (1968)	YES (on factors)	None (used Sheffield's)	Orthogonal (Sheffield's)	NO	YES	Summed over items
BOSHIER (1971)	YES	Principal components	Oblique	YES	*	*
BOSHIER (1976)	NO	Principal components	Orthogonal	NO	YES	Normalized regression weights
BURGESS (1971)	YES	Maximum likelihood	Biquartimin oblique	NO	YES	Normalized regression weights
DICKINSON & CLARK (1975)	NO	Principal components	Orthogonal	NO	YES	Summed over items
FLAHERTY (1968)		Principal components#	Orthogonal†	YES	YES	Normalized regression weights
GRABOWSKI (1972)	NO	Simple structure	Oblique	NO	NO	No information**
HAAG (1976)	YES	Principal components	Orthogonal	NO	YES	Normalized regression weights
MARPLE (1969)	NO	None (used 16 Sheffield items)	None	NO	YES	Summed over items
MORSTAIN & SMART (1974)	NO	Principal components	Orthogonal	NO	YES	Summed over items
SHEFFIELD (1964)	NO	Direct factor analysis	Orthogonal	NO	NO	Insufficient information given
STAUFFER (1966)	NO	Principal components	Orthogonal	NO	NO	Insufficient information given
SOVIE (1972)	NO	Principal components	Orthogonal	NO	YES	Normalized regression weights
ZACK (1976)	NO	Principal components	Orthogonal	NO	YES	Normalized regression weights

Input was orientation items, plus other social and psychological data
* Factor scoring not relevant to purposes of the study
** Probably normalized regression coefficients
† To obtain second-order factor an oblique rotation was performed.

TABLE 2

EDUCATION PARTICIPATION SCALE: FACTOR STRUCTURE
AFTER ORTHOGONAL ROTATION OF NINE FACTORS

No.	E.P.S. Item								
11	To give me higher status in my job	75							
24	To prepare for service to the community	59							
3	To secure professional advancement	59							
22	To help me earn a degree, diploma or certificate	58							
20	To increase my competence in my job	57							
16	To keep up with competition	56							
4	To become more effective as a citizen of this city	54							
6	To carry out the recommendation of some authority	52				46			
14	To acquire knowledge ... other educational courses	48							
12	To supplement a narrow previous education	46							
33	To comply with my employers policy	40							
2	To share a common interest with my spouse or friend		(-37)						
15	To fulfil a need for personal associations ...		-45						
35	To improve my social relationships		-49						
45	To improve my ability to participate in community work		-58						
19	To participate in group activity		-66						
44	To make new friends		-68						
28	To become acquainted with congenial people		-68						
23	To escape television			-40					
13	To stop myself becoming a cabbage			-52					
26	To have a few hours away from responsibilities			-63					
31	To get a break in the routine of home or work			-63					
9	To overcome the frustration of day to day living			-63					
5	To carry out the recommendation of some authority			-75					
37	To take part in an activity which is customary ...				70				
39	To maintain or improve my social position				66				
38	To meet some formal requirements				61				
34	To keep up with others				60				
47	To comply with instructions from someone else					72			
42	To comply with the suggestions of someone else					65			
36	To carry out the expectations of someone ... authority					52			
46	To comply with the fact people with status ...					44			
25	To gain insight into human relations						70		
21	To gain insight into myself and my personal problems						68		
32	To improve my ability to serve mankind						47		
8	To satisfy an enquiring mind							70	
1	To seek knowledge for its own sake							68	
43	To learn just for the sake of learning							61	
7	To respond to the fact that I am surrounded ... learn							43	
48	To assist me when I go overseas								-42
10	To be accepted by others								-43
17	To meet members of the opposite sex								-46
40	To escape an unhappy relationship								-60
29	To provide a contrast to the rest of my life								53
30	To obtain some immediate practical benefit								50
41	To provide a contrast to my previous education								48
18	To escape the intellectual narrowness ... occupation								46
27	To clarify what I want to be doing 5 years from now								45

TABLE 3

INTER-CORRELATION BETWEEN FIRST-ORDER MOTIVATIONAL ORIENTATION FACTORS*

	To reach a Personal Goal	To Know	To Escape	To reach a Social Goal	To comply with Formal Requirements	To reach a Religious Goal	To take part in an Activity
To reach a Personal Goal	1.00	-.34	.78	.28	-.83	.57	-.77
To Know		1.00	-.26	-.30	.33	-.13	.28
To Escape			1.00	.22	-.91	.62	-.93
To reach a Social Goal				1.00	-.23	.01	-.22
To comply with Formal Requirements					1.00	-.62	.91
To reach a Religious Goal						1.00	-.59
To take part in an Activity							1.00

* Reproduced, with permission, from a Personal Communication by Burgess (13)

FOOTNOTES

[1] The author would like to thank Paul Burgess for sharing items from the R.E.P. and for his helpful and open attitude concerning this review. In particular, we are grateful for permission to reproduce Table 3.